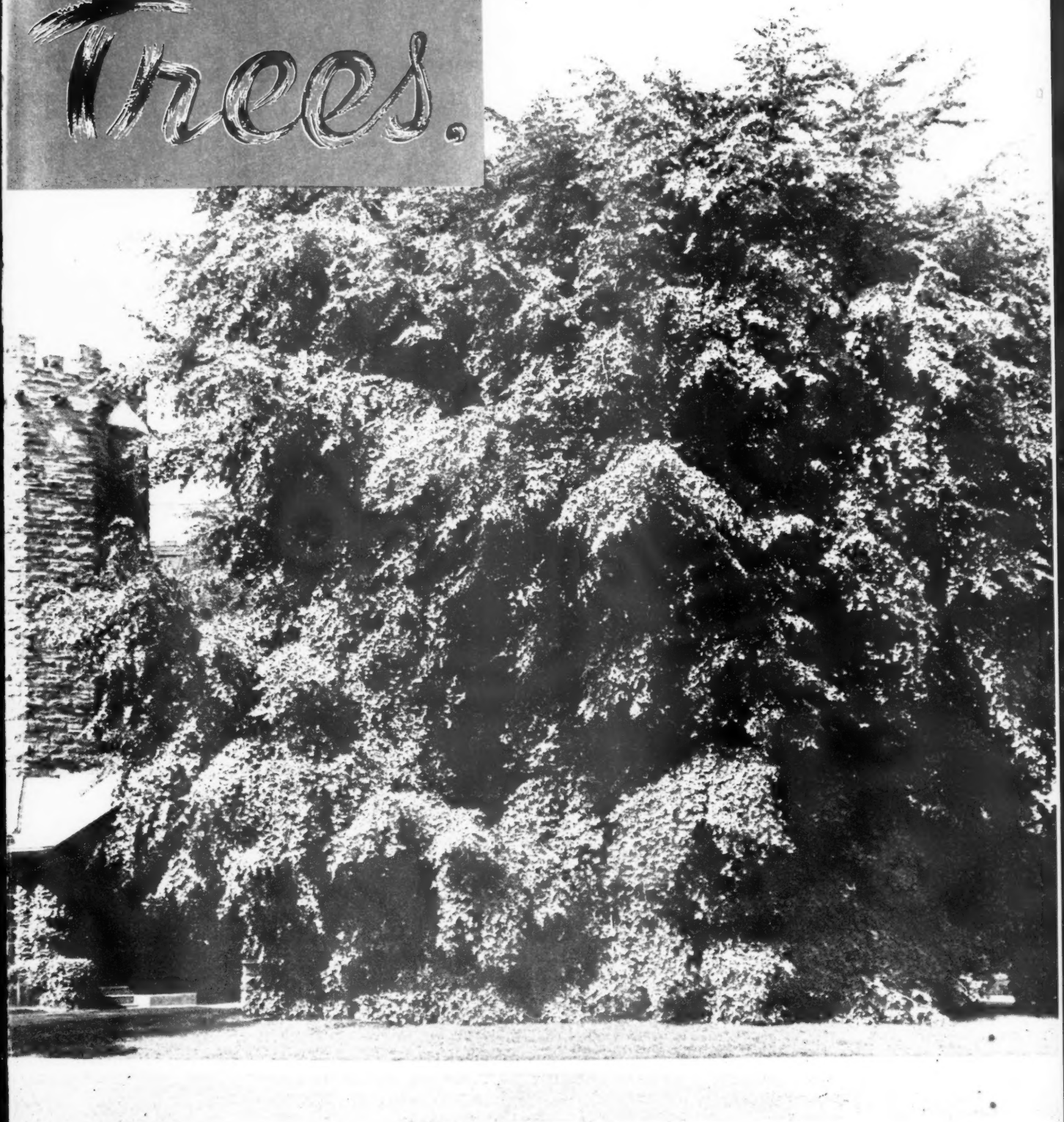
Trees.



European Weeping Beech *(Fagus Sylvatica pendula forma)* at the Morris Arboretum, Chestnut Hill, Philadelphia, Pa.

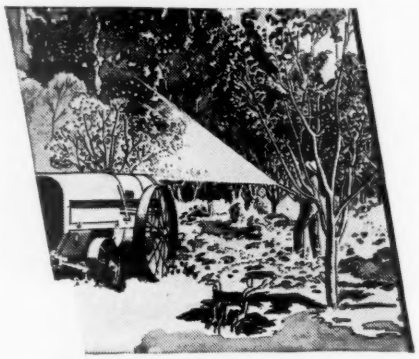
NUTRITIONAL REQUIREMENTS OF PLANTS — *L. C. Chadwick*

TREE SELECTION SURVEY — *John C. Swartley*

May, 1945 — *The Journal of American Arboriculture* — 25 Cents

CONSISTENT SPRAYING IS A PART OF GOOD MANAGEMENT TODAY

Shade trees, ornamental shrubs, fruit trees, nurseries, gardens and recreation areas can be protected and enhanced by a little spraying at appropriate times. Without an adequate spray program loss will result and often irreplaceable things will be destroyed by insect pest and parasites. Also use your Hardie for fire fighting, mosquito control and application of liquid fertilizers and weed killers.



Hardie shade tree sprayers and general purpose outfits are available under rationing rules. Repair parts, all service materials—new pumps, guns, hose, etc.—for any Hardie, however old, can be had promptly from any Hardie dealer or The Hardie Mfg. Company, Hudson, Mich., Los Angeles, Calif., Portland, Oregon.

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DEPENDABLE SPRAYERS

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TREES Magazine is a bi-monthly Journal published at Santa Monica, California, by Edward H. Scanlon, and is devoted to the furtherance of the technical and business administration of Trees (Street and Ornamental); Parks (Municipal and National); and Forests (State, National and Private), in the U. S. P. O. Box 886, Santa Monica, California. Subscription by mail, $1 per year; outside United States, $1.50. Advertising rates upon inquiry. Unsolicited manuscripts must be accompanied by postage return.

ALONG THE WAY

With . . . EDW. SCANLON

■ BARTLETT HOOKER of PARKENSON & HOOKER, Riverdale, Md., says his tree service is in a TEMPORARY ECLIPSE, but RENEWS HIS SUBSCRIPTION to TREES for "WHAT I CONSIDER THE BEST PUBLICATION OF ITS SORT TO BE HAD ANYWHERE." THANKS for the PAT, BART.

* * *

■ *BELIEVE IT OR NOT, but CHARLIE IRISH has begun his SECOND CHILDHOOD—he has the MUMPS. We Really SHOULDN'T LAUGH we know, but CAN ANY ONE IMAGINE CHARLIE trying to ARGUE POLITICS with the MUMPS.*

* * *

■ And to TOP OFF the "sick bay" report (very salty, eh wot?) FORREST STRONG (ex-Navy) has just RECOVERED from ANOTHER kid affliction, CHICKEN POX. What is the TREE WORLD coming to.

* * *

■ *The LOS ANGELES PARK DEPT. HAS ADDED A "SMELL" JOB TO FRED ROEWEKAMP'S multitudinous duties — KEEPER OF THE ZOO—could say he is now HIS BROTHER'S KEEPER.*

* * *

■ Very FREQUENT letters from HAROLD NEWINS are very, very WELCOME. Bet HAROLD had a DIFFICULT TIME deciding not to hold the SOUTHERN CHAPTER SHADE TREE CONFERENCE. Come out to CALIFORNIA, HAROLD, for the 10th WESTERN CHAPTER meeting, May 20th —You're WELCOME.

* * *

■ *WHAT HAS HAPPENED to all the old CORRESPONDENTS. The ARMY and NAVY certainly hasn't GOBBLED all of them.*

* * *

■ BILL SPEED staggered in with A LETTER the other day. FORREST STRONG and BOB THOMPSON are faithful, but most of THE OLD GANG seem to HAVE CRAMPS.

* * *

■ *WHAT DO ALL of you GOOD PIPLES think of THE IDEA for a "NATIONAL ARBOR DAY." Let's have SOME LETTERS expressing YOUR OPINIONS.*

* * *

■ *NORM ARMSTRONG, good old NORM, down in the CAROLINAS suh, the guy is going to POP A GOATEE and MINT JULEPS on us someday, but ANYWAY NORM is working hard. NICE MARKET, doing direct FIELD SUPERVISION HIMSELF.*

* * *

■ *Well the good OLD NAVY and me ARE GETTING quite chumy. I'm FIGHTING the BATTLE of TERMINAL ISLAND. (FIGHTING OFF the Long Beach girls). Boy how this BLUEJACKET GETUP works on them. It's WONDERFUL, even MY WIFE loves me MORE.*

* * *

■ Down in WOOSTER, OHIO, the CARPENTERS LOCAL has a NEW BOOT (boy am I salty). PAUL TILFORD not having ENOUGH TO DO spends ONE DAY A WEEK making CRATES to pack WAR SHIPMENTS. Next time we see him HE'LL PROBABLY be playing THE VIOLIN with THREE FINGERS.

■ *EDWIN IRISH, CHARLIES big boy, is in there PITCHING in an ARMY UNIFORM. He's learning how IN CALIFORNIA —pleasant, BEAUTIFUL SURROUNDINGS.*

THE COVER PICTURE: The picture of the magnificent weeping beech on the cover was sent to TREES by our good friend H. J. Hohman of Kingsville Nurseries, Kingsville, Md., thru the courtesy of Mr. Spencer H. Davis, Jr., of the Morris Arboretum.

CONFERENCE MEN IN THE SERVICE

Upper left: H. Stevenson Clopper, Jr., Aviation Cadet, Army Air Force, University of Florida. Upper right: Homer (Red) Jacobs, Davey Tree Expert Co., now with the Navy Construction Battalion, as a Photographer's Mate 2nd Class, Camp Endicott, R. I. Lower left: Major L. A. Stearns, University of Delaware entomologist, now doing anti-malaria work for the Army in Iran. Lower Center: Edw. H. Scanlon, Editor of TREES, Coxswain, Navy, Terminal Island, Calif. Lower right: Karl Amalia, Arborist, Technical Sergeant, March Field, Calif.

DO NOT FORGET TO SEND CHANGE OF ADDRESS

May, 1943 *The Journal of American Arboriculture* Volume 5 — No. 6

EDWARD H. SCANLON, Editor
P. O. Box 886—Santa Monica, California

"No place is complete without trees. A home without trees is charmless; a road without trees is shadeless; a park without trees is purposeless; *a country without trees is hopeless*"

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CORDIALLY YOURS

PUBLIC TREE CONSCIOUSNESS—STEP No. 1

Most Americans love trees, those who do not have little appreciation for any of the fine things of life and as a result amount to little or nothing.

For the many millions who love trees we in the various professions that cater to their dissemination, care and utilization should collaborate in a grand effort to bring to these people a greater knowlédge of the needs, utility and beauty of trees. Little has been done in this direction on the basis of a well laid, well executed plan enthusiastically and efficiently carried out by the coordinated efforts of the many societies and organizations in the United States devoted to Forestry, Arboriculture, Nurseries, Garden Clubs and others.

We should begin to lay plans now for postwar activities. Officials in political subdivisions need awakening to the value of trees; home owners large and small need much more education, and generally all will profit by a greater arboreal appreciation in America.

There is a serious lack of such a plan; nor has a coordinated publicity plan ever been embarked upon by the related organizations and professions dealing with trees.

TREES has many times proposed that a publicity plan be laid out and EXECUTED. However, without going into the discussions and details that such plans would entail let us propose to effect the laying of what we would consider as the cornerstone of any plan, regardless, that might eventually be concocted.

This cornerstone should be, must be, a day set aside in the whole of the United States when trees will be praised and planted in every metropolis and hamlet—A National Arbor Day. This is step No. 1.

No, there is nothing new about Arbor Day, but very definitely a single date of observance thruout the country would be. What day shall it be? Arguments over this point could be endless, but why go any further than to select April 22. This date is the birthday of J. Sterling Morton, former Governor of Nebraska, and generally recognized as the "Father of Arbor Day." (The Morton Arboretum, Lisle, Illinois, is dedicated to his memory).

In 1885 the State of Nebraska made April 22 a legal holiday, and it has remained as such to this day. A list giving the date for Arbor Day in each state shows that no other state observes this day. However, the majority have designated either a day in March or April, or a date by proclamation of the Governor.

Only in some of the southernmost states would this date be a bit late, however, this could be easily overcome by planting at an earlier day and then holding ceremonies on April 22.

The value of a single day for Arbor Day is immediately apparent to anyone. Newspapers, the radio, and magazines could

be induced to collaborate in such a noble undertaking. Service clubs, schools, city, state and federal governmental agencies would be glad to cooperate in such a beneficial movement. This would be the cornerstone for the grandest plan for making the public tree conscious that could be devised. Its a natural and offers dozens of avenues by which to increase public knowledge of the need for trees—trees for camouflage, trees for streets, and highways, fruit trees, forest trees, shade trees and just plain old trees to look at, admire and love.

TREES has taken the initial step toward the establishment of APRIL 22 as NATIONAL ARBOR DAY. We have written the Governor of each state asking for his cooperation by proposing this day of observance to his legislative bodies.

In order further to effect this adoption many organizations will be needed to appeal to the Governors with their approval and assent. May we ask for expressions from the officers of such organizations.

Let us pursue this STEP No. 1 with vigor, regardless of the war because it will require several years before all legislatures, no matter how willing they may be, can enact such a fine law that will be so beneficial to every man, woman and child of this, and future generations of America.

Insurance For New Young Trees

SHADE TREE COMMISSION
LOWER MERION TOWNSHIP

Montgomery County, Pennsylvania
Township Bldg.
Ardmore, Pa.
October 14th, 1942.

American Chemical Paint Co.
Horticultural Dept.
Ambler, Penna.

Gentlemen:

We have had excellent results with your "Transplantone" in the planting of shade trees in this Township. In particular, a planting of over one hundred fifteen foot Elms, bare root, on Centennial Road looked bad this Spring. These trees were planted during the Fall of 1941 and due to the drought of last Fall and this Spring, they had not made any progress by May. On May 5th they had not leafed out, although established trees in the neighborhood were in full leaf.

We gave two applications of "Transplantone" (one ounce to ten gallons) using our three hundred gallon spray tank for applying the solution on the perforated soil around the base of the trees. By May 30th over ninety per cent of the trees had leafed out. Our losses are less than five per cent. We are calling this to your attention because in our opinion, on May 5th, our losses would have been great.

We have made it our practice to use "Transplantone" in our regular planting program and we are highly pleased with the results.

Very truly yours,
S/ J. C. KENEALY,
Tree Warden.

Western Chapter (N. S. T. C.) Meeting May 20th To Feature "Scientific Camouflage" Army Film

The Arroyo Seco Clubhouse of the Los Angeles Park Dept. will be the scene of the 10th Annual meeting of the Western Chapter, National Shade Tree Conference, on May 20th—one day.

The decision to maintain an unbroken series of these Western Shade Tree meetings was reached by the executive committee and announced by President Pierre Miller of U.C.L.A.

The meeting will be cut to one day, but it is believed by the committee that such an abbreviated meeting will be welcomed by all members, inasmuch as many have expressed their desire that the conference be held. The annual banquet will not be held, only a noontime lunch will be served at the Clubhouse. The Clubhouse is located on the Arroyo Seco Parkway between Los Angeles and Pasadena. Instructions for reaching it will be mailed soon.

The meeting will open at 9 a. m. with a lecture by Maunsell Van Rensselaer, Curator of the Santa Barbara Botanic Garden on "Trees of Santa Barbara." The talk will be illustrated with many beautiful Kodachrome slides.

Dr. Ralph H. Smith of U.C.L.A. will follow with a paper "Mites Injurious to Shade Trees."

A subject that has aroused much interest in these days of shortages will occupy the next spot, "Cork Oak Planting in California." This will comprise information and slides compiled by Professor Woodbridge Metcalf of the University of California.

After lunch there will be a paper tentatively scheduled and titled, "Line Clearance Development in Wartime." A speaker has been invited for this subject.

The last paper on the program will commence with what it is hoped will be a very interesting roundtable discussion. That title is, "Street Tree Planning in Postwar Civic Development," by Edward H. Scanlon, Consulting Arborist. On the roundtable panel for discussion will be the following: Ralph D. Cornell, Landscape Architect; H. Dana Bowers, State Landscape Engineer; Ray Hartman, Leonard-Coates Nurseries; Karl Amalia, Amalia & Hartney Tree Service, Boston, Mass. (Karl is in the Army at March Field); Leslie Mayne, Arborist; and a city planning authority who has been invited.

The meeting will close with a business session. Send your reservations as soon as possible to Pierre Miller, University of California at Los Angeles, 405 Hilgard Ave., Los Angeles, Calif.

FLASH !

A late message from Karl Amalia, Camouflage School at March Field, brings news of an outstanding feature for the program. A new all color film entitled "Scientific Camouflage" has just been completed and Karl assures us that he has received almost definite assurance from the commanding officer that the picture can be shown. This will be the first showing of this invaluable contribution to the science of camouflage. This should be the incentive for a large turnout for this SUPER COLOSSAL "world premiere."

Tale of the Unfortunate Arborist

Once upon a time there was a Scotch arborist who was so tight that he wouldn't spend a copper penny to get his name on TREES mailing list. Last month he sent his son to borrow TREES from a neighbor. In his haste the boy overturned a $6.00 hive of bees, which soon made him look like a warty squash. Hurrying to the son's assistance the thrifty Scot didn't notice a barbed wire fence; ran into it, pulled it down, cut himself and ruined a $5 pair of britches. The family cow went through the hole in the fence and killed herself eating too much green corn. Upon hearing the commotion the guid wife came running out of the house. She stumbled over a churn of cream and fell into a basket of kittens, killing all seven of them. The baby, left alone, crawled through the cream into the settin' room and ruined a $37.00 carpet. The dog got excited and scared up thirteen setting hens. The oldest daughter, taking advantage of the fracas, ran away with the hired man and the calf busted loose and chewed the tails off'n four shirts on the wash line. This month there's a new name on TREES mailing list.

—Thanks to Bob Thompson.

Trees...

Diagnosis Series---Nutritional Re q

L. C. CHADWICK

Associate Professor of Horticulture, Ohio State University, Columbus, Ohio

Ornamental plants to be most effective should present a pleasing habit and rate of growth, attractive foliage and, in many cases, interesting flowers and fruits. Often within the course of their development, either in the nursery or later, plants do not show satisfactory growth. One of the most essential factors for good growth is an ample supply of the necessary nutrient elements.

During the past decade, outstanding progress has been made in the study of nutrient deficiencies and the so-called physiological disorders. Several of these disorders have now been traced to a deficiency of an essential element. Nutrient deficiency symptoms have been determined by general observations and by experiments in which plants were grown in quartz sand or water culture and supplied with nutrient solutions lacking each of the essential elements in turn. These observations and experiments have been exceedingly valuable in diagnosing the appearances and effects of deficiencies which may be expected under field conditions.

A large portion of the research on nutrient deficiencies has been conducted with fruits, especially citrus and apples, and field crops, notably tobacco. Recently some ornamentals, mostly flowers, have been studied.

Research on nutritional deficiencies with ornamental shrubs and trees has been very limited, but no one will question the need for more extensive work with this group of plants. Even in face of the present emergency it is hoped that research with this group of plants will not be discontinued entirely. Perhaps the curtailment of fertilizers for ornamental plants makes it even more important that symptoms of nutritional deficiencies be recognized. It is the purpose of this discussion to review some of the work on this subject that has been reported with the hope that it may prove a valuable aid to arborists, landscape gardeners and nurserymen in recognizing such symptoms, and to give a basis for efficient application of the nutrient elements.

The Essential Elements

Several elements are essential for plant growth. Of these only nitrogen, phosphorus and potassium are present in all so-called complete fertilizers and are the ones most often limited to plant growth. Carbon, hydrogen and oxygen are normally present in ample quantities in the atmosphere to assure growth. Calcium, iron, magnesium and sulfur may be deficient in certain soils and must be added to the complete fertilizers or supplied as separate salts. Recent experimental evidence would seem to show that some trace elements, boron and manganese and possibly copper and zinc, are necessary, at least in very small quantities, for the proper development of some plants. Each one of these elements has its own peculiarities in their effect upon plant growth. Some may be present in adequate quantities in the soil but yet be unavailable because they are tied-up in compounds the plants cannot use. In order to understand how these elements affect plant growth, a few facts may be reviewed.

Hydrogen is taken into the plant in the form of water which composes a large percentage of the total plant. Water acts as medium through which plant nutrients move from roots to other parts of the plant, there to become a part of such foods as sugars and amino acids, later to be transformed into cellulose and other compounds which will form the solid structure of the plant. Cells function normally only when water is present in adequate amounts to maintain turgidity. This turgidity is dependent upon a balance between intake and outgo as water and moisture vapor. Excessive concentration of salts in the soil due to overdoses of fertilizer may cause the root cells to lose water instead of absorbing it, thus the plant wilts. Decreases in cell turgidity may cause certain symptoms of malnutrition. If water is not absorbed some of the essential elements may actually become limiting.

Oxygen is normally present in sufficient quantities in the air to give good plant growth. Certain cultural and planting practices may, however, bring about a deficiency of oxygen. Such a practice would be deep planting in poorly drained soils. In such cases, plant roots might not obtain sufficient oxygen to function properly. It has been estimated that as much as 50 per cent of the dry matter of a plant is made up of oxygen. It enters into combinations with all the other elements by processes of oxidation and reduction. Elements in the form of nitrites and sulfites require oxidation to become nitrates and sulfates, forms available to plants. An upset in the normal oxidation and reduction processes within the plant may cause certain malnutrition symptoms, such as iron deficiency when potassium is lacking but iron is present in ample amounts.

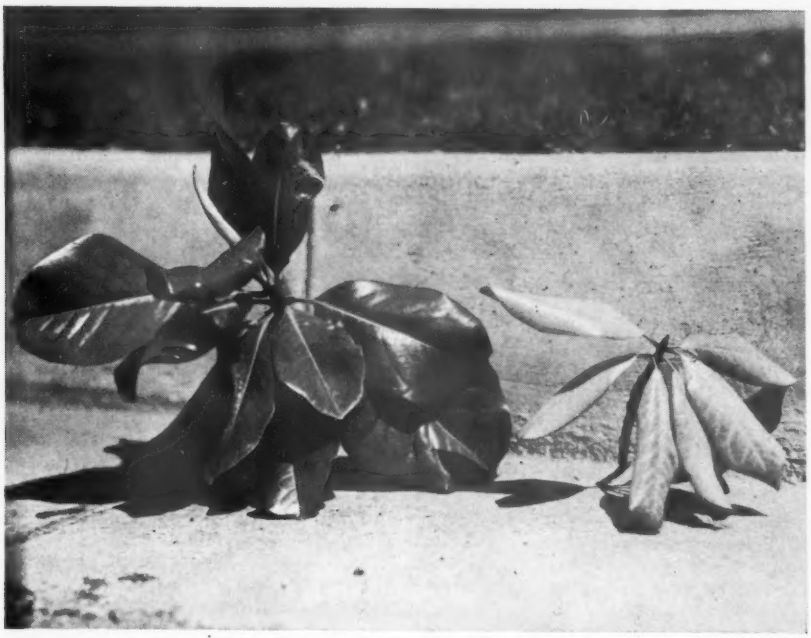
The source of carbon essential to plant grow is carbon dioxide of the air. Carbon dioxide in the presence of the green chlorophyll of the leaves and energy from the sun is formed into various forms of carbohydrates, proteins, and fats. It is a component of cell walls, color, fragrance and all organic compounds.

Nitrogen is one of the most essential elements for plant growth. It is found in the atmosphere, is present in soils high in organic matter but generally needs to be added in the form of nitrate or ammonium fertilizers in cultivated soils. Large quantities of elemental nitrogen are present in the air but only the legume plants, by bacterial action within the nodules on the roots, are able to utilize this source of nitrogen. For most plants it has to be combined with hydrogen, oxygen and carbon before it is of use to growing plants. Virgin soils, high in organic matter, contain relatively large amounts of nitrogen. Recently, experimented evidence indicates that sod mulches aid in building up quantities of nitrogen in the soil. Nitrate nitrogen is in solution in the soil and is easily lost by leaching and run-off, consequently becomes the element most often limiting under cultivation.

In the plant nitrogen enters into the structure of protoplasm, chlorophyll, amino acids, proteins and alkaloids. Nitrogen is needed for both the vegetative and reproductive stages of growth. Fruit men have been aware for some time that applications of a nitrogen fertilizer to soils low in nitrogen content will result in an increase in fruit set. Probably the same reaction would occur with ornamental plants grown for attractive fruits. Since nitrate nitrogen is readily available in the soil, it is usually suggested that it be added at periods when plant roots are active. Some recent experiments with ornamental trees have shown, however, that applications made annually over a ten-year period, in April, July and October, have resulted in similar increases in caliper growth.

Phosphorus is essential to cell division and cell wall construction. It is essential for formation of nucleic acids, nucleo-proteins and possibly other materials found in almost all living cells. It aids root development, hastens maturity, stiffens tissues and stimulates flower and seed production. Since it penetrates the soil slowly when applied to the surface, it should, when possible, be incorporated thoroughly with the soil at the time of bed preparation. Practically all phosphorus is absorbed in the plant in the form of phosphates. It may counteract

e quirements of Ornamental Plants



—Photo Courtesy Ted Holderness

Lack of color, size and turgidity in the foliage specimen on the right in this photo, indicates serious lack of some essential nutrient. Specimen on the left is normal foliage, rich, lustrous and normal size. Both specimens are of Magnolia Grandiflora.

toxicity developing from organic acids and precipitate aluminum.

Potassium is thought to be necessary for the manufacture and translocation of starches and sugars. In this role it may act only as a catalytic agent. It may be considered as a general conditioner, in that it is influential in overcoming excessive succulence and brittleness, in hastening maturity of the plant, as an aid to seed production, and in intensifying the color of flowers. Potassium appears to be necessary for good r oot development and is a controlling factor in the absorption and loss of water by the plant. It has been suggested as aiding in resistance to disease, cold and other adverse conditions.

Calcium is just as essential to plant growth as nitrogen, phosphorus and potassium but it is less often lacking in cultivated soils. Calcium exerts its influence both within the soil and also within the plant. It favors development of necessary bacteria, it counteracts the toxic effects of certain salt combinations in the soil, improves its physical structure, and aids in the liberation of nitrogen, phosphorus and postassium. Within the plant, it functions in the transportation of starch, metabolic processes, in formation of the cell wall and in the stiffening of stems. Calcium may function in the formation of the nuclei and chlorplast, and it possibly aids magnesium, postassium, and boron in the part these elements play in plant growth.

Iron, magnesium and sulfur are usually present in sufficient quantities in the average soil but may become unavailable due to certain soil reactions. Iron is essential for the development of the green coloring matter, chlorophyll, in the leaves, without which there would be no food manufactured. It is said to be beneficial to the growth of some fungi and may promote the fixation of atmospheric nitrogen by soil bacteria. Iron is unavailable in alkaline soil or where phosphorus is present in excess amounts.

Magnesium functions in the formation of seeds, nucleo-proteids, cell division, chlorophyll and in transportation of phosphates. It facilitates the assimilation of sulfur and nitrogen. Sulfur is a constituent of an amino acid. In the soil it is found in combination ammonium, calcium and potassium ions in the form of sulfates.

Boron, manganese, copper and zinc are considered as minor or trace elements. They may be as essential to the well-being of the plant as the other elements discussed, but such small amounts are necessary that they are not generally limiting. The function of boron in the plant is not clearly understood. Recently it has been stated that it regulates the water relations of the plasma colloids and that it is concerned in carbohydrate transportation and utilization. In this function it appears to be closely associated with calcium. The role of manganese appears to be catalytic. It functions in chlorophyll formation and is possibly related in some way to flower production. Boron and manganese deficiency most often occur in alkaline soils. Little is known relative to the essential nature of copper but it is reported to be necessary for all or most growth phases. Some workers have reported a specific effect of copper on seed production. Deficiencies of copper occur most often in soil high in organic matter such as peats and mucks. The role of zinc in the plant is, likewise, not clearly understood. Reports have shown that it is effective in correcting such physiological disorders as little-leaf and rosette in some plants but how it acts as a corrective is not known.

Several other elements have, from time to time, been reported to show stimulative effects on plant growth but their necessity for growth is not definitely assured. Among these are chlorine, silicon, sodium and molybdenum.

Deficiency Symptoms

Diagnosis of unsatisfactory growth condition is not an easy matter. Abnormal growth may be due to various causes such as climatic conditions, insect and disease troubles, injury from spray material, soil conditions, including poor drainage, insufficient aeration and lack of essential nutrients, mechanical injuries and others. Diagnosis becomes a matter of logical procedure in the elimination of the factors responsible for poor growth. To one familiar with the normal growth habit and characteristics of the tree or plant in question, and a thorough knowledge is essential, it often does not take long to determine the general cause of abnormal development. The more information the diagnostician has concerning cultural practices previously followed and other pertinent information, the easier the task becomes. Climatic and soil conditions are as a group more difficult to diagnose than insect and disease troubles.

Nutritional deficiencies are the most difficult to diagnose in the early stages of their development, become easier as the symptoms become more advanced. Since in advanced stages of nutrient deficiency, extensive injury to the plant may have occurred and considerable time is necessary to correct it, it is important

(Continued on page 12)

Trees...

Mass Color In Protective Concealment*

F. M. Trimble
St. Louis, Mo.

The landscape architect in developing a large planting job is faced with several major problems. While the selection of design and planting materials of a kind, type and cost constitute the principal concern, the architect must invariably keep in mind the basic color requirements of the planting as a whole. The proper coordination of all these features produces what may be termed "balance" which is essential to the acceptance of the work, and to which end the architect must apply his best technical ability. In most cases the architect's selection of plant materials of a certain color is usually secondary in importance, whereas in protective concealment it necessarily assumes a position of prime importance.

In protective concealment, especially of permanent structures, strict adherence to the use of the proper basic or mass color common to the immediate locale would appear important. While artificial colors incorporated in paint and fabrics, deception with topographic features and replication of plantings and structures will continue to serve a very important place in the final camouflage picture, most all of these can be readily identified should they not conform with the mass color common to the normal appearance of the plant growth and soil of the immediate environment. With a continued increase in the speed and heighth of the operation of combat and bombing planes it is to be expected that some of the minor details in protective concealment may now be reduced. Although the aerial camera equipped with color filters can spot man-made minor changes in the color of objects on the ground surface, the bombardier cannot locate these identical objects with the unaided eye when, from such heights, he will only be able to identify large objects and mass color. When essential structures are duplicated in every respect, even to maintenance of the mass natural color of the vicinity, it is going to be next to impossible to bomb or strafe them with any degree of certainty, particularly those not "tied in" with large topographic features such as rivers, lakes or mountains.

The trained plantsman can identify plant growth regions and general soil types by inspection of clear photographs taken through color filters, yet he cannot be of much assistance to the bombardier flying 350 m.p.h. at 35,000 feet elevation, in the selection of a vital point hidden among a replication of similar objects, all of which fit in with the unbroken natural mass color of the area.

The most success in protective concealment will come to those, like the successful landscape architects, who are equipped to keep in mind the requirements of the individual project, while at the same time apply proper technique in associating design, species and basic colors to make the project fit in with the entire community as a whole. A large proportion of all protective concealment work could well be classified as "native" planting jobs wherein the camoufleur will need to reproduce natural growth and general appearance of the community in every respect. Most landscape men restrict their commercial fields of operation to a limited section involving but one or only a few plant growth regions. Since modern warfare has ceased to be a "local affair" there would appear to be a real need for plantsmen in camouflage work, having a wide knowledge of ecology, silviculture and landscape planting, in order to intelligently handle the unending types of problems that will come up for solution.

In the continental United States there are fifty important soil regions and thirty-two major plant growth regions. These two groups occur without relation, one to the other, and in addition the plant growth regions vary as to altitude and location, making it apparent that the camoufleur, who finds it necessary to operate beyond a restricted area, must treat each and every project separately to obtain the necessary degree of protective concealment. As examples of the many combinations of plant growth, we have: the association of spruce, fir and birch on the Maine coast; the dwarfed forms of sassafras, bird cherry, holly, live oaks and beach grasses along the Coastal Plain; in the Piedmont Plateau we will find many dominant mixtures among which we most commonly see the Jersey scrub pine, red and white oaks and red cedar, extending south into the yellow pine and oaks, and thence into yellow pines with palmetto ground cover. Westward from the Piedmont Plateau we observe the common mixture of white pine, red and white oaks with occasional Jersey scrub pine and hemlock over the Allegheny Mts., followed by oak, maple and elm across the Mississippi watershed to the grass covered plains. Entering the Rocky Mts. we first find the pines and dwarf oaks then the blue spruce, Colorado spruce, pine and fir, beyond which we cross the semi-arid mountains and valleys bearing various desert plants, chapparral and occasional pines, to the Pacific Coast mountains. Further North, the transcontinental flyer would find many other combinations in crossing the Rockies and Sierras.

Each of the above plant growth regions is represented by a natural basic color which changes however, when the density varies with the proportion of hardwood* and softwood trees, or when found upon a soil having an individual color. We might expect to find a limited resemblance between similar plant groups of a given altitude in a North and South direction, while they would vary quickly in traveling from East to West. The average plantsman can soon learn to differentiate between the major plant groups, but when soil types, colors and altitude enter into the picture we have a major problem facing the camoufleur operating in a country with as frequent changes in plant associations and soils as found in the United States.

In some plant growth regions the mass color will remain unchanged for hundreds of miles. In others a gradual change in the degree of plant associations will go almost unnoticed, as contrasted to those regions bordering desert land where mountain timber quickly changing to grass and chaparral brings about a rapid color transition.

In regions having a fairly equable distribution of hardwood and softwood trees the problems will be numerous and require careful treatment. A uniform mixture of softwoods and hardwoods produce the ideal conditions for summer protection, but with the advent of fall, when the hardwood trees drop their foliage, we are faced with an entirely new set of requirements. Frankly, long-term protective concealment in such localities is never at a standstill. In other words, concealment here must keep apace of the seasonal changes and those workers well grounded in knowledge of the appearance of plants and soils throughout

*The definition of basic or mass color of an area has been adopted, for use in this paper, to indicate the general color of an area observed from a distance with the unaided eye. This color will vary from time to time in accordance with the season, the position of the observer in relation to the object and the percentage and type of ground cover, recognizing that refraction of light is the principal factor largely responsible for variations in the colors visible to the human eye.

*Hardwoods are generally accepted as those trees which lose their foliage once a year, while softwoods are represented by the needle-leaved trees or conifers.

(Continued on page 18)

Tree Selection Survey

By JOHN C. SWARTLEY
Lakewood, Ohio

More and more, home owners have become aware of the aesthetic and practical value of trees. They have come to realize their value to the extent that many are not satisfied to plant small trees and wait for results. The modern American demands prompt satisfaction of his wants. He desires an immediate effect and frequently is willing to pay for it. This attitude is reflected in the increasing tendency to use larger trees in civic plantings. But there is one serious handicap, for in most localities, selection is limited to a few desirable, native species that lend themselves to transplanting and further limited to individuals that are healthy and shapely, located in situations where digging and transport are practicable. Especially near the larger cities, this available native stock is being rapidly depleted. The comparatively few nurseries that sell a good assortment of trees in large sizes are scattered so widely that frequently the cost of transportation is prohibitive. Also, most nursery trees have been grown too close together for good specimen material. These factors lead to the obvious conclusion that the growing of trees in the larger sizes will in the future become increasingly important. The war has affected the present market but there is little doubt concerning the future market and large trees cannot be grown while turning around.

To obtain some idea of the relative demand for such trees as to species and variety, a questionnaire was devised and sent to 94 leading landscape architects and arborists in the Eastern and Middle Western St: :s. Of 49 replies received, 41 were satisfactorialy answered. These were analyzed according to the different geographical areas represented, 12 replies for the Middle Atlantic States, 7 for the New England States and 22 for the Middle Western States. A large tree was defined as one that is normally transplanted with a ball of earth, of four inch caliper and larger. Those questioned were advised to answer from an ideal point of view and to consider insect and disease resistance and resistance to drought and storm damage, in addition to landscape value. Naturally, certain trees like white oak and hickory are notoriously difficult to transplant in any sizes. But for the purpose of selection, such trees were included.

The questionnaire was divided into four more or less supplementary parts. In the first part the experts were asked to indicate the relative percentages of the chief groups of plants, that they would consider ideal for their requirements. The groups were designated as maples, oaks, elms, lindens and miscellaneous. Disregarding geographical areas, an analysis of all of the answers gave the following approximate figures: maples 21%, oaks 28%, elms 26%, lindens 9%, miscellaneous 16%. Comparison of the answers from the different areas disclosed the following facts. The Middle Atlantic States would plant fewer maples and elms and nearly twice as many oaks as the Middle Western and New England States. The New England States would plant about twice as many lindens as the other two areas. The three areas agreed fairly closely on the percentage of miscellaneous trees.

In the next part of the questionnaire, the larger groups were broken down into the most important species and varieties, each to be assigned to one of three classes according to relative merit. The classes were designated as "worth most consideration," "worth some consideration," "worth little consideration." Seven common species of maple, including four varieties were indicated. In all three areas, Acer platanoides, A. rubrum and A. saccharum were voted "worth most consideration," with the latter an undisputed favorite in the Middle Western States. Likewise, the narrow growing varieties of these species were deemed "worth some consideration," as were Acer platanoides Schwedleri and A. pseudoplatanus. The freely planted Acer saccharinum (dasycarpum) was voted "worth little consideration" in the Middle Atlantic and Middle Western States. Of twelve species of oaks, including Quercus robur pyramidale, all three areas agreed on two, Quercus borealis maxima (rubra) and Q. palustris. Also voted "worth most consideration, were Quercus coccinea for the New England and Middle Western States, Q. robur for the New England States and Q. robur pyramidale for the Middle Atlantic and New England States. All of the other oaks listed, with the exception of one little known species, were rated "worth some consideration" in at least two areas. Six species of elms and two varieties were listed. Of these, Ulmus Americana was the only one placed in the highest class in all three areas. Of course in those localities subject to Dutch Elm Disease or *Phloem Necrosis,* the American elm is out for the present. Ulmus Americana Moline was voted "worth most consideration" in the Middle Western and New England States and Ulmus procera (campestris) in the New England States. Ulmus carpinifolia

(Continued on page 14)

—Photo Courtesy Rochester, N. Y. Park Department
A splendid street of Upright Maples, (Acer saccharum columnare) in Rochester. This tree is excellent for narrow streets.

COMBINED PROCEEDINGS DRAW PRAISE

The recently published proceedings of the new National Shade Tree Conference with its Southern and Western Chapter meetings recorded, has drawn words of praise from outstanding Arborists thruout the country. A few of the reactions are reproduced here:

Received your card regarding comments on the combined proceedings of the National Shade Tree Conferences, and would say this is a big step in the right direction. I am sure it will save time and money, as well as being a valuable reference for all who are interested in the progress of arboriculture.

FRED ROEWEKAMP,
City Forester, Los Angeles.

The "Proceedings" has always been the "Bible" of the Arborists and now it has become of greater value. Fortunate is the man who has the last eight or ten issues, for in them he can find the answers to nearly all the problems involved in the arboricultural field.

Too much credit cannot be given to Dr. Paul E. Tilford in producing the Proceedings of the joint Conferences last year and to Dr. L. C. Chadwick for his untiring efforts in joining the three organizations into one.

The re-organized National Shade Tree Conference is much larger and stronger than ever before. It is more national in scope and will contact and influence a great many more individuals and organizations. Its powers and field of education to the public are now unlimited.

W. STANLEY SPEED.

"The Combined Proceedings of the Eighteenth *National Shade Tree Conference,*" including as it does the proceedings of the Fifth *Southern Shade Tree Conference,* February 19-21, 1942, Miami, Florida, and the Ninth *Western Shade Tree Conference,* May 7-9, 1942, Long Beach, California, is the very best record yet of any of our Shade Tree Conferences. I have been impressed not only by the excellent format of the Proceedings, but also the clever manner in which the material has been assembled.

Paul E. Tilford, the Editor, has accomplished something here approaching an ideal for Conference Editors to aim at. We are hopeful, however, that Paul may continue to be the Editor and that he will be required to make the rounds of the Conferences, particularly the Southern Shade Tree Conference, if he may be as thoroughly on the job as he was at Miami, Florida. He has not only combined the various proceedings but has also combined the usual wit and humor at these meetings, with the necessary professional papers. Of course, the Editor does not deserve all the credit—the "lion's share," perhaps, goes to the secretaries who recorded the minutes. Right here the Southern Conference makes a bow for Miss Kay Sloan who did such a swell job at recording our minutes. We hope that Bob Weakley can arrange for Miss Sloan, his efficient secretary, to grace the next meeting of the Southern! Also, that he and the boys will keep up the friendly attempt at "heckling" which tends to keep the meetings more democratic and less academic.

Cordially yours,
H. S. NEWINS

THE NAMING OF HORTICULTURAL VARIETIES

Many an intelligent plantsman is up against a blank wall when it comes to providing a name for some new plant he thinks he has found. Shall the name be in Latin or in English? Shall it be a botanical variety, a horticultural variety, or a "form"? If it is a hybrid, just what is the correct procedure in order to give it a proper name that will be accepted by horticulturists and botanists alike? There is an ever-increasing tie between the botanist and the practical plantsman, as far as the scientific names of plants are concerned, for both groups have agreed that it is best to follow the International Rules of Botanical Nomenclature, as approved by the International Botanical Congress, Cambridge, England, 1930.

Even though everyone agrees to the International Rules, the naming of new plants is difficult, and in the following discussion it is hoped that the correct procedure for naming new varieties is clearly set forth.*

Variety

First, it is necessary to understand the concept of a botanical variety. The correct definition would be—A variety is a subdivision of a species composed of individuals differing from other representatives of the species in certain minor characters which are often of geographical significance, and which are usually perpetuated through succeeding generations by seed.

Form

A form is a subdivision of a *species or variety,* usually differing in only one character and often appearing sporadically throughout the range of the species; it is usually perpetuated vegetatively but may be perpetuated by seed, in which case only a certain percentage, as a rule, will be identical with the original form and the remainder will revert to the species or variety.

In some cases no clear line between a variety and a form can be drawn. Also, the two terms have been used and are used interchangeably, so that differentiation between the two is often exceedingly difficult. Both the variety and the form as above described should be given a Latin name, and the original description, it would be given the same name no matter where or when it occurs.

Clon

On the other hand, there is a large group of plants which fail to come true from seed. Individuals in this group may be outstanding, and are perpetuated solely by asexual propagation of one kind or another. Such plants may be considered *forms* or they may be considered *clons* (formerly spelled clones). A clon is a group of plants composed of individuals reproduced vegetatively from a *single* plant. Hence, though a form may also be propagated vegetatively (a clon must be), the form may appear again anywhere at anytime and should be given the same name as its predecessor, whereas the clon constitutes a group of plants propagated from a *single specimen,* and if all the members of this group should happen to die, no plant in the same genus should ever be given the same name again regardless of where or when it occurs.

If the plant is considered a form, it is given a Latin name, and any time in the future that a plant is found conforming to the original description, it takes the same Latin name. In other words, a form name is one given to a group of individuals which may have originated over widely separated areas. A clon name is one given to a single individual and its vegetatively propagated progeny.

—Donald Wyman, *Arnoldia.*

* See also Jour. Arnold Arb. 10: 65, 1929.

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Experiments With Redwoods Around New York

By HENRY VAUGHN-EAMES
Arborist
Westfield, N. J.

In our experiments to get the California redwoods to grow in the New York area we have had no success, whatever with the Coast Redwood, *"Sequoia sempervirens."*

We have planted them in the spring as well as fall, and only if the winter is very mild do they ever live through it. Even if the winter is moderately cold they are winter killed. The leaves or needles, which are similar to Taxus or Yew, turn brown and drop off. From then on the tree slowly dies.

The big tree or *Sequoia Gigantea*, however, seems much more adaptable to this climate. In 1936 we planted our first half dozen giganteas in an area extending from Tarrytown, New York, to Red Bank, New Jersey, a distance of about 100 miles. The following year more were planted in an area around Trenton, New Jersey, and since then still more have been planted. All are surviving, except in one place, where the dirt from a newly dug cellar was dumped on them.

One of them has been moved three times. It seems to take the transplanting very well, but the rate of growth, after moving is very slow. The tree which was moved around is now only about four feet tall, while those of the same age, which have not been moved, are about seven feet tall.

The rate of growth when the trees are young is sometimes slightly over one foot per year.

The photograph shows the size of one of the trees planted at Paterson, New Jersey in 1936. The photograph was taken early in 1941. This was a one foot tree when planted.

The trees were shipped here from Ontario, California, via express, in one gallon and two gallon can containers. Those in the one gallon cans were about one foot tall and those in the two gallon cans were about two feet tall. They arrived in excellent condition. The foliage of the *gigantea* is somewhat similar to the Eastern Red Cedar, but the small plants are more conical in shape.

We planted them as soon as possible after their arrival. No special preparation of the soil was made. We handled them as we would any other evergreen. If the soil did not seem friable enough we brought in new top soil. In some cases a small amount of fertilizer, such as de-hydrated cow manure was added.

—*Photo by Author*

The Sequoia gigantea referred to by the Author in the text. (Note the Nazi salute Henry is giving).

We dug the holes about two or three times the size of the balls and packed the dirt carefully around the roots and soaked them thoroughly to get all the air holes out. They seemed to take hold almost at once.

After the trees became established the care is about the same as that given Boxwood in this climate, except that spraying is unnecessary. Established *giganteas* seem as resistant to disease and insect damage here in the East as they do in their native West. Even the Japanese Beetles pass them by. One of the reasons for their long life, of course, is that they have built up this resistance. They are, however, affected by dogs and some chemical repellant to dogs is highly recommended.

As long as the trees are small enough, it is advisable to give them some type of winter protection. The usual burlap covering drawn fairly tight around a framework of stakes is sufficient. We did not find that covering the top helped any.

Snow does not seem to affect them, but they do grow better when protected somewhat from the winter winds.

When first planted, there is a tendency for the top to die back a short distance. Apparently, this is a purely physiological condition as no insect or disease has been found. This does not seem to affect the shape of the tree in any way as the top adjusts itself the following year. So far, all the *giganteas* under our care have retained their conical shape.

We have also tried to raise seedlings, but so far have not succeeded. Several plantings were made in flats, in the greenhouse and although they were given constant care, they were very susceptible to damping-off. Precautions were taken and some experiments were made but we have not been able to obtain really good healthy seedlings. We are continuing these experiments and are trying to work out some plan whereby we can raise our *giganteas* from seed.

How long ago the seed was deposited no one knows, but the General Sherman Tree in Sequoia Natural Park must be at least 3000 years old. Anyway, it has lived long enough to accumulate the staggering weight of 12,335,639 pounds. This particular tree is 274 feet in height, has a base circumference of 102 feet and a base diameter of 37 feet. Even 100 feet above the ground the diameter of this tree is 18 feet and its largest branch is 7 feet thick.

It is interesting to note that there now exists some transplanted trees in the east which have reached a height of sixty feet or more.

The writer of this article has also seen some healthy looking specimens of about this height at Kew Gardens in London and at Fontainebleau near Paris, France.

On the whole, it is obvious that it is possible to grow these interesting trees over a wide range of territory and if given reasonable care (such as can be given by any intelligent home owner that is interested) the *Sequoia Gigantea* should prove a valuable addition to our Eastern States and will do much to add to the variety and beauty of our landscapes.

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SAVE-THE-REDWOODS LEAGUE
219 California Hall, University of California
Berkeley, California

DIAGNOSIS SERIES

(Continued from page 7)

that the diagnosis be made as early as possible. A keen observer will be able to notice symptoms much sooner than one who is less observing or is not familiar with the characteristic growth of the plant.

Mineral elements may become deficient for a number of reasons. They may not be present in sufficient quantities to give adequate growth. Conditions may arise where an ample supply of an element may be present in the soil but it is tied up in compounds not readily available to the plant. The quantities of mineral nutrients required cannot be easily placed on a mathematical basis. Environment factors of light, temperature and moisture will affect growth and the more vigorous the growth, the greater the amounts of nutrients required.

A certain balance between essential elements is necessary. A high nitrogen condition increases the demand on potassium. The use of nitrogen continuously may bring about a deficiency of potassium, although normally the amount would be ample. High lime may bring about a deficiency of potassium, iron or manganese. A balanced relationship between other elements is also necessary.

Foliage deficiency symptoms of the various elements are either apparent at the base or tip of the current season's growth. With nitrogen, phosphorus, potassium, magnesium and zinc, the symptoms are apparent on the older leaves; with iron, manganese, sulfur, calcium, boron and copper, the chlorosis or breakdown is first apparent on the young leaves. This difference in parts first affected is due to the relative mobility of the reserve supplies of these elements within the plant. With those that are readily mobile, foliage deficiencies are first apparent in the older leaves, while with those that are not readily mobile, the deficiencies show first in the young leaves.

The following chart and key to nutritional troubles is given with some hesitation since there is so little information available on deficiency symptoms occurring in woody ornamental plants. A survey of the literature will show, however, that deficiency symptoms of several of the mineral elements show remarkably similar characteristics in a variety of plants including truck crops, farm crops, tobacco, fruit trees and flowers. Perhaps woody ornamental plants can be added to this list. Observations indicate this to be the case with some of the elements. It should be understood, however, that it is doubtful if all the symptoms would be common to all plants.

The chart and key are not based on original experimental evidence, but on

—*Photo by* TREES

Fertilizing trees with the Irish Aero-Fertil Gun

observation and a partial survey of the literature. Their greatest value may lie in stimulating interest in this field of research with woody ornamentals and to provide a guide for arborists, nurserymen and landscape gardeners in diagnosing mineral deficiencies under field conditions. Corrections and additions should be made as freely as experimental evidence and observations warrant. Presented is the incentive; in the near future it is hoped that verification and clarification of the symptoms, in ornamentals, will be forthcoming.

CHART OF PLANT NUTRIENT DEFICIENCY SYMPTOMS

It is important to stress that the first indications of most, if not all, deficiencies are such symptoms as less secondary thickening of the new shoots, fewer new breaks and retardation in growth rate of laterals and shoots. More advanced stages show the typical coloration, chlorosis or break-down of the leaf.

NITROGEN DEFICIENT

General

Nitrogen deficiency common in woody plants.
First indication of nitrogen deficiency is usually retardation in rate of growth of laterals, shoots and suckers and fewer new breaks.

Leaves

Following symptoms usually more pronounced on lower leaves of current season's growth.
Leaves uniformly yellowish or light green, without any amount of darker green tissue adjacent to the veins. Leaves show no mottling.
New leaves small.
Presence of reddish veins and petioles.
Leaves born in upright position, petioles forming narrow angle with stem.
Sometimes premature shedding of leaves.

Stems

Growth stunted as indicated under "General" above.
Stems slender but stiff and woody and with few new breaks.
Reddish or purple cast to stems frequently present.
Terminal bud forms early.

NITROGEN EXCESS

General

Excess nitrogen may cause excessive vegetative growth with resulting smaller number of flower buds. Such plants will be soft and excessively succulent.
Where nitrogen is excessive and light within the plant poor, overly slender stems and thin leaves are often produced.

Leaves

Leaves large and dark green.
Later leaves may become puckered or crinkled.
Characteristic potassium deficiency symptoms may develop.

Stems

Excessive growth
Many sucker shoots
Maturity delayed
Reduction of flower buds in proportion to leaf buds.

PHOSPHORUS DEFICIENCY

General

Frequency of phosphorus deficiency in woody ornamentals not known.
First symptoms of deficiency are retardation in rate of growth of shoots and development of fewer breaks.

Leaves

Following symptoms usually more pronounced on lower leaves of current season's growth. Leaves dark, grayish or dull green, often leathery.
Lower leaves on current season's growth become yellow between the veins or at the margin in cases of extreme deficiency.
Leaves sometimes mottled.
Petioles and leaves purplish, particularly near tips of twigs.
New leaves small.

Stems

Growth slender, usually short internodes.
Slow breaking of buds in the spring.
Fewer stems.

POTASSIUM DEFICIENCY

General

Deficiency common in woody plants, especially fruits, growing in sandy soils. Important early symptoms include production of few new breaks and failure of laterals to develop normally.

Leaves

Following symptoms localized on older, lower leaves of current season's growth.
Leaves first show reddish brown discoloration mostly confined to marginal region. Margins later become brownish-orange or purplish. Necrotic spots may appear near tips and margins.
Leaves finally become hard and brittle, with broken and ragged margins, exhibiting an ashy or purplish-gray color.
Leaves remain attached to stem even after considerable injury.

Stems

Total vegetative growth restricted.
The fewer growing shoots may be as long as usual under normal conditions.

MAGNESIUM DEFICIENCY

General

Magnesium deficiency quite common in woody plants. Symptoms usually do not appear before mid-summer. Most often occurs in acid, sandy soils.

Leaves

Following symptoms localized on older, lower leaves of current season's growth.
Symptoms appear as yellowish green or grayish-green or fawn-colored blotches.
Chlorosis progresses inward from margin.
Defoliation progresses from base to tip of current growth, falling early.
New leaves small, thin and soft in texture.

Stems

General stunting, retardation in growth rate.

Die-back of twigs in severe cases.

Zinc Deficiency

General

Deficiency probably not common with woody ornamentals.

Leaves

Following symptoms appearing in early stages on older leaves of current season's growth.

Leaves chlorotic, mottled or with white or yellowish streaks between the veins.

Typical "little-leaf" or rosette of pecans and fruits, "mottle-leaf" of citrus, "yellows" of walnut and "crinkle-leaf" of peach.

Leaves falling soon after deficiency symptoms appear.

Stems

Flower bud formation greatly reduced.

Twigs die-back after first year.

Branchlets arising from below affected parts produce nearly normal leaves.

Iron Deficiency

General

Common in many woody plants

Occurs in soils of high pH (alkaline).

Leaves

Early stages of deficiency localized in young leaves at shoot tips.

Leaves chlorotic between the veins; larger veins remain green.

Leaves may become almost white.

Breakdown of tissues at margin or at irregular blotches.

Leaves from terminal buds are weak, appear tufted.

Stems

Chlorosis may show on single branch, part of tree or all of tree at one time.

Poor development of buds, but terminal bud remains alive until acute stage.

Severe cases result in branch die-back and a stagheaded condition.

Manganese Deficiency

General

Most apt to occur on alkaline soils.

Leaves

Early stages of deficiency localized in young leaves at shoot tip.

Young leaves chlorotic, much the same as occurs with iron deficiency but necrotic spots are found scattered over the whole leaf.

Small veins remain green giving netted effect to leaves.

Stems

Growth weak.

Terminal bud remaining alive until acute stage.

Die-back in severe cases.

Sulfur Deficiency

General

Little is known concerning the prevalence of sulfur deficiency with woody plants.

Leaves

Early stages of deficiency symptoms localized in young leaves on shoot tips.

Young leaves chlorotic throughout, or with the veins lighter than adjoining interveinal areas.

Little necrosis or breakdown.

Stems

Stems thin, less succulent than normal and stunted.

Terminal bud remaining alive until acute stage is reached.

Copper Deficiency

General

Most often occurs in peat and muck soils.

Deficiency probably not common with woody ornamentals.

Leaves

Early stages of deficiency symptoms appearing in young leaves. At first, leaves dark or bluish green, later show some chlorosis or a bleached appearance.

Leaves wilt easily.

Stems

Terminal buds remain alive until late stages when some die-back may appear.

Calcium Deficiency

General

Seldom deficient in woody ornamental plants

Occurs in highly acid (pH 5.5 or below), sandy soils.

Root breakdown may precede or accompany foliage symptoms.

Leaves

Early stages of deficiency symptoms appear in young leaves.

Leaves nearly normal at first, later slightly yellow.

Young leaves sometimes hooked at tip and exhibit a rolled margin.

Break-down appearing at tip and margin of young leaves. Sometimes break-down limited to central portion of margin.

Stems

Terminal bud dies or remain inactive after early stages of deficiency.

Growth restricted and stunted.

Severe cases show die-back of stems.

Boron Deficiency

General

Probably not often important in woody ornamental plants.

Several troubles, such as cork and drought spot and measles of fruits, browning of cauliflower and cracking of stems of celery seem to be due to boron deficiency.

Leaves

Early stages of deficiency symptoms appear in young leaves.

Leaves yellowish green at base followed by break-down.

Dwarf, thickened, brittle leaves arise from nodes.

Internodes short, giving rosette or witches-broom effect.

Stems

Buds often fail to develop in the spring.

Terminal bud dies early followed by die-back of twig by mid-summer.

Stems brittle.

Dark green water-soaked spots appear near tip of the twig. Sometimes fluxing from these spots.

Premature defoliation.

Key To Plant Nutrient Deficiency Symptoms as May Apply To Woody Plants

The very early symptoms, such as fewer new breaks and retarded growth, cannot be readily keyed out since they are more or less common to all deficiencies. The following key to the more advanced stages may be helpful.

1. Symptoms which, in the early stages of deficiency, tend to be localized in the older leaves of the current season's growth or are more or less general on whole shoot.
2. Symptoms rather generally distributed over whole extent of current season's growth but usually more pronounced on lower leaves of current season's growth. No necrotic or dead spots on foliage except in advanced stages of development.
3. Leaves uniformly yellowish or light green. Petiole forming narrow angle with stem causing leaves to be born in more upright position. Veins and petioles reddish.

—Nitrogen deficient

3. Younger leaves on current growth dark green but duller than normal. Older leaves become yellow or slightly mottled between the veins. Young twigs, petioles and often main veins show abnormal amounts of purplish-red color.

—Phosphorus deficient

2. Symptoms localized on older, lower leaves of current season's growth. Leaves are chlorotic or mottled and may or may not show necrotic or dead spots.
4. Leaves remaining attached to the twig even after considerable marginal scorching and break-down. Early symptoms appear as purplish or olive-brown margins. In some plants margin becomes yellow instead of purple. Later these become reddish or grayish-brown giving a scorched margin. This break-down may extend toward mid-rib of the leaf. Leaves become brittle and break up at the margin. Necrotic areas bordered by purplish or green tissue, not yellow.

—Potassium deficient

4. Leaves usually falling soon after deficiency symptoms are apparent. Dropping progresses from base to tip of current season's shoots.
5. Early symptoms appear as yellowish-green, grayish-green, or fawn-colored blotches between the veins or near the margin of the leaves. The veins and tissues adjoining remain green. Symptoms usually not appearing until mid-summer. The yellowish blotches finally become brown in color, typical of break-down. Brown necrotic areas bordered by narrow region of light-green to yellow-green tissue.

—Magnesium deficient

5. Early symptoms appear as rosettes of small narrow chlorotic, mottled or white streaked leaves at tips of current season's shoots. These symptoms are usually preceded by dropping of leaves from bases of current shoots. Symptoms appear in the spring.

—Zinc Deficient

1. Symptoms which ,in the early stages of deficiency, tend to be localized in young leaves at the terminals of current season's shoots.
6. Terminal buds remain alive until late or severe stages of deficiency develop.
7. Leaves chlorotic or yellow in early stages of deficiency, with no indication of permanent wilting of new growth.
8. Leaves chlorotic or yellow between the veins; the veins remaining green.
9. Only larger veins remain green. Necrosis or break-down does not occur until advanced stages of deficiency. Leaves may be nearly white in color. In advanced stages there is break-down of tissues at margins or inward toward the mid-rib. Die-back finally occurs.

—Iron deficient

9. Small veins remain green, giving netted appearance to leaves. Necrotic areas soon found scattered over whole leaf blade.

—Manganese deficient

8. Leaves more or less uniformly chlorotic or light green in color, or the veins lighter than adjoining interveinal area. Few, if any, necrotic areas appear.

—Sulfur deficient

7. Leaves remain normal or darker green in color in first stages of deficiency. In acute stages, the interveinal area may become chlorotic or show a bleached appearance. Young leaves lack firmness and exhibit wilted condition.

—Copper deficient

6. Terminal bud dies or shows no further development after early stages of deficiency.
10. Leaves nearly normal or only slightly yellow in color in early stages of deficiency. Later leaves may become hooked

(Continued on page 17)

Tree Selection

(Continued from page 9)

sarniensis (campestris wheatleyi), U. glabra, U. procera (campestris), U. pumila and U. thomasi (racemosa) were rated "worth some consideration" in at least two areas. Of eight species and hybrids of linden, Tilia Europaea (vulgaris) rated "worth most consideration" in the Middle Atlantic and New England States, and T. cordata and T. tomentosa rated the same in the New England States. Tilia Americana, T. cordata and T. euchlora were granted "worth some consideration" in at least two areas. Apparently, only New England has any respect at all for Tilia petiolaris, which in the writer's opinion, is a discredit to this beautifully graceful tree, well suited for large estates and parks. Perhaps it is not well enough known.

Under miscellaneous trees, 44 species and varieties were mentioned, disregarding small trees such as crabapples, redbud and flowering dogwood. The following were rated "worth most consideration": Ginkgo biloba, Gleditsia triacanthos Thornless, Liquidamber styraciflua and Magnolia soulangeana in all three areas; Fagus sylvatica and the variety Fernleaf, Ginkgo biloba Sentry and Platanus occidentalis in the Middle Atlantic and Middle Western States; Aesculus hippocastanum, Betula papyrifera, Halesia monticola, Magnolia acuminata, Platanus acerifolia, Prunus sargenti, P. yedoensis, Salix elegantissima, and Sophora japonica in the New England States; Gleditsia triacanthos in the Middle Atlantic States. The sections that did not place the above trees in the highest group, agreed that they were "worth some consideration." The species voted "worth some consideration" in all three areas are Carpinus betulus, Celtis occidentalis, Fraxinus americana, F. pennsylvanica lanceolata, Gymnocladus dioicus, Larix decidua (europaea), Phellodendron amurense, P. sachalinense. The species voted "worth some consideration" in at least two areas are Aesculus glabra, Betula pendula oycoviensis Cutleaf (alba gracilis), Carya ovata, Fraxinus excelsior, F. quadrangulata, Populus alba Bolleana, Salix blanda, S. niobe and Taxodium distichum.

In analyzing the above from the geographical viewpoint, it is interesting to note that a larger variety of trees is favored in the New England States. This may be partially due to more favorable growing conditions but there is also the indication of a wider appreciation of trees possibly due to the influence of the Arnold Arboretum.

At the end of the miscellaneous list, the experts were given the chance to recommend favored trees, not included in the list. Most of those noted were small trees which the writer had purposely omitted. Among the larger types, 16 species and varieties were recommended once; 3 species, namely Cladrastis lutea, Koelreuteria paniculata and Populus simoni, were recommended twice; and Quercus bicolor was recommended thrice.

In the third part of the questionnaire, twenty common trees were listed. These, the experts were asked to rate separately, in one of three classes, according to (1) insect and disease resistance, (2) drought resistance, (3) resistance to storm damage. The following trees were rated:

Acer platanoides
rubrum
saccharinum (dasycarpum)
saccharum
Fagus grandifolia
sylvatica
Fraxinus Americana
Ginkgo biloba
Gleditsia triacanthos Thornless
Liquidamber styraciflua
Liriodendron tulipifera
Nyssa sylvatica
Platanus acerifolia
Quercus borealis maxima (rubra)
coccinea
palustris
Tilia cordata
tomentosa
Ulmus Americana
pumila

Ginkgo biloba, Quercus borealis maxima, Q. coccinea, Q. palustris were rated highest in all three points in the three areas. Acer platanoides, A. saccharum, Gleditsia triacanthos were rated highest in all three points in at least two areas. Fagus grandifolia, F. sylvatica, Liquidamber styraciflua, Nyssa sylvatica received the highest rating in insect and disease resistance and resistance to storm damage in at least two areas with medium rating in drought resistance. Likewise, Fraxinus Americana was rated high in insect and disease resistance and also drought resistance with a medium rating in resistance to storm damage. Liriodendron tulipifera, Platanus acerifolia, Tilia cordata, T. tomentosa received a spotty high to medium rating. Acer saccharinum and A. rubrum received a spotty low to medium rating.

In the fourth and final part of the questionnaire, the experts were asked to list the five best trees for street planting under each of four different conditions. The answers reflect the overlapping which exists under the actual conditions. In each category, the trees are listed in the order of frequency found in the replies, from the highest to the lowest. The frequency is given after each tree. Those mentioned less than four times are not included. If the tree was not mentioned by experts in all three areas abbreviations indicate the area or areas represented, M. A. signifying Middle Atlantic States, M. W. Middle Western States and N. E. New England States.

Trees for Medium to Wide Suburban Streets

Ulmus Americana, 30.
Acer saccharum, 24.
Quercus palustris, 23.
Quercus borealis maxima (rubra) 22.
Acer platanoides, 12.
Platanus acerifolia, 8.
Ginkgo biloba, 6.
Celtis occidentalis, 6, M.W.
Fraxinus americana, 5, M. A., M. W.
Liquidamber styraciflua, 5, M.W.
Platanus occidentalis, 4, M.A., M.W.
Quercus alba, 4, M. A., M. W.
Tilia Americana, 4, M.A., M. W.
Ulmus procera (europaea) 4, M.W., N.E.

Trees for Narrow to Medium Suburban Streets

Ginkgo biloba, 18.
Quercus palustris, 18.
Tilia cordata, 13.
Ulmus americana Moline, 13.
Acer saccharum, 10.
Liquidamber styraciflua, 9.
Acer platanoides, 8.
Ulmus carpinifolia sarniensis (campestris wheatleyi) 5, M. W.
Acer saccharum Sentry 4, M.W., N.E.
Ginkgo biloba Sentry, 4, M.A., M.W.
Gleditsia triacanthos, 4, M.W., N.E.
Prunus sargenti, 4.

Trees for Medium to Wide City Streets

Ulmus americana, 21.
Platanus acerifolia, 17.
Acer platanoides, 16.
Acer saccharum, 12.
Quercus palustris, 12.
Ginkgo biloba, 11.
Quercus borealis maxima (rubra) 11.
Platanus occidentalis, 6.
Ailanthus altissima (glandulosa) 5, M.A., M.W.
Quercus coccinea, 5, M.A., M.W.
Acer rubrum, 4, M.A., M.W.
Celtis occidentalis, 4, M.W.
Fraxinus americana, 4, M.A., M.W.
Gleditsia triacanthos Thornless 4, M.W.
Tilia cordata, 4.
Ulmus americana Moline, 4.
Ulmus procera (europaea), 4, M.W., N.E.

Trees for Narrow to Medium City Streets

Ginkgo biloba, 17.
Quercus palustris, 12, M.A., M.W.
Ulmus americana Moline, 11.
Tilia cordata, 10.
Platanus acerifolia, 9.

(Continued on page 16)

Redwood Grove to Honor Founder of Arbor Day

The Save-the-Redwoods League in its annual report is directing attention to the announcement that a splendid Redwood Grove in northwestern California has been preserved in honor of J. Sterling Morton, founder of Arbor Day.

The Morton Memorial Redwood Grove, in Humbolt Redwoods State Park, has been established through gift of a fund by Mr. Sterling Morton, Mr. Mark Morton and Mrs. Jean Morton Cudahy, of Chicago, and Mrs. Caroline Morton, of New York. They are of the family of J. Sterling Morton (1832-1902). He was Secretary of Agriculture in the Cabinet of resident Cleveland, from 1893 to 1897. *Arbor Day originated and was first observed in Nebraska in* 1872, at the time Mr. Morton was a member of the State Board of Agriculture there. The observance of Arbor Day has spread very widely, virtually all the States taking note of its importance as a tree-planting day and a time to stress forest conservation.

The Morton Memorial Grove is in the Avenue of the Giants area, below Dyerville, Humbolt County—immediately west of the Redwood Highway, and north of the C. F. Krauss Redwood Grove. The gift to the State is through the Save-the-Redwoods League.

Members of the League are participating in contributing a fund to designate an addition to the grove, adjoining the Eel River, in honor of J. Sterling Morton as founder of Arbor Day.

Joy Morton, father of Mr. Sterling Morton and Mrs. Jean Morton Cudahy (Mrs. Joseph M. Cudahy), and brother of Mr. Mark Morton, was founder of the famous Morton Arboretum at Lisle, Illinois. Mr. Mark Morton is the third and only surviving son of J. Sterling Morton. The other sons were Joy Morton, Paul Morton (Secretary of the Navy in 1904), and Carl Morton. Mrs. Caroline Morton, daughter of Paul Morton, is one of the donors of the Morton Memorial Redwood Grove.

SPHACELOMA CAUSING SCAB OF MAGNOLIA GRANDIFLORA

Sphaceloma has been identified recently on leaves of *Magnolia grandiflora* from Georgia and Mississippi. It produces few to almost innumerable slightly raised spots on the upper side of the leaf. These may be scattered over the entire blade, or be most numerous along the midrib or in the marginal region. Spots are circular to irregular and gray with a more or less indefinite brown border. When fully developed, they often reach not more than 1.5 mm. in diameter; although, by coalescence, they form discolored areas that may involve as much as three-fourths the area of the upper leaf surface. Where the leaf is severely infected, particularly along the margin, the tissue may be killed, appearing brown on both leaf surfaces. Acervuli of the *Sphaceloma* are sparse to abundant; as seen through a hand lens they appear as small superficial b l a c k masses. The organism is described as a new species; it is suggested that it may be indigenous to the United States.—Anna E. Jenkins, N. J. Agr. Notes.

YOUR DOLLAR
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"The Buck That Brings 'em Back Alive"

BUY BONDS

Tree Selection

(Continued from page 14)

Acer platanoides, 6.
Liquidamber styraciflua, 6, M.A., M. W.
Gleditsia triacanthos, 5, M.W., N.E.
Acer platanoides Column, 4, M.W., N.E.
Acer saccharum Sentry, 4, M.W., N.E.
Ginkgo biloba Sentry, 4, M.A., M.W.
Ulmus Americana, 4 ,M.W.
Ulmus carpinifolia sarniensis (campestris wheatleyi) 4, N.W., N.E.
U. parvifolia, 4.

The questionnaire evoked some interesting responses. Some were not content with answering in routine fashion so they made notes in the margin. Others wrote letters, expanding personal views. One particular person wrote a "commentary" consisting of three and one-half pages of detail. Some of the views expressed, ran counter to the majority opinion. For instance, one expert rated Acer rubrum very high in resistance to storm damage. He wrote "I have had occasion to observe this tree in four severe sleet storms and one hurricane and it came through astonishingly well." He added, "While I classed sugar maple as a number one tree, I found it very susceptible to storm damage, not at all drought resistant and quite subject to disease and insect attack, particularly insect. The Norway maple is, in my opinion, so useless that I created a fourth class in which to place it." Two experts agreed that Quercus palustris, because of its weeping habit as it approaches maturity, is not suitable for street planting.

Many of the answers were not based on the ideal, as desired; instead they reflected the present supplies and prices. This was apparent in many cases but was elucidated in only one reply, as follows: "In the case of street trees on narrow streets there are many small type trees that would probably be quite suitable. These, however, have been omitted because of their high price in some instances and because of their doubtful popularity, since they have not been used to any great extent in any locality."

A reply from Cleveland, Ohio, indicated a possible defect of Moline Elm that bears checking. "It is doubtful in our opinion that this elm should be considered in drought areas which of course includes Ohio for the reason experienced by Cincinnati. It was reported to us that the new planting of Moline Elm there died in the drought because the tree is not able to shed its leaves after the manner of the American Elm when the water table quickly recedes as in a drought. If true, the tree is of little value."

—*Photo by H. J. Hokman*

A splendid specimen of Upright Ginkgo (Ginkgo biloba fastigiata) a fine street tree

Some interesting comments were made in the same letter about some trees not mentioned in the questionnaire, as follows: "Quercus shumardi, hardy north into southern Michigan is apparently the fast growing red oak planted on Winston Road, along Spring Grove Cemetery, Cincinnati. I wish someone would identify and propagate this oak at Cincinnati . . . Salix pentandra (laurifolia) in larger sizes than now available would be a fine small tree. It seems to be blight and insect free* and is a useful small tree for housing projects and very narrow streets. Aesculus carnea should be in this list because it is drought resisting, has ornamental flowers and grows 40-70 feet high while A. glabra remains about 35 feet. Also, as A. carnea has about disappeared from the market, it should be definitely recommended. There are two examples of Pterocarya, one about East 30th and Euclid Avenue (smoky) and one about East 79th and Euclid. Both are large, handsome, thriving, growing under neglect. Collected seeds have never germinated. One of the best." The suggested identity was Pterocarya fraxinifolia or P. rehderiana.

*This is not generally true (author).

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ORDER FROM *Trees Magazine*

Diagnosis Series

(Continued from page 13)

at tip and rolled at the margin. This is followed by browning and break-down at the tip and margin of leaf. Margin break-down may be limited to central portion. Later break-down may extend inward toward center of leaf.

—Calcium deficient

10. Leaves chlorotic, sometimes only near the base. Later become brittle and break-down develops. Youg stems become brittle.

—Boron deficient

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DECAY RETARDENT

Decay, incessant enemy of wood, is retarded by the chemical urea used to reduce checks, cracks and similar defects which may occur during the drying of green lumber, according to laboratory investigations reported by F. H. Kaufert and E. A. Behr of the University of Minnesota.

Tests with southern pine sapwood and Douglas fir, red oak and cypress heartwood showed that urea applied in the quantities approaching those used in the drying process prevented the growth of wood-rotting fungi. Concentrations of urea greater than 0.3 per cent, based on the oven-dry weight of wood, reduced the rate of decay; concentrations greater than 1 per cent prevented all growth of the wood-rotting fungi on the wood's surface.

For chemical seasoning approximately 40 to 100 pounds of urea per thousand board feet is recommended, depending on the type and dimension of the wood. The chemical's effectiveness is based on the maintenance of a considerable concentration between the surface and the interior. Concentrations in the outer one-eighth inch of the treated wood may be 10 per cent and higher, based on the dry weight of the wood, while at a half inch from the surface they may be less than 0.3 per cent. Definite preserving action would be exerted, the investigators feel, if these concentrations could be maintained under conditions conducive to decay.

Heating urea-treated wood causes some loss of urea. However, it appears to fix some of the chemical with the wood, either as urea or a reaction product, so that it is difficult to remove by leeching.

Urea, manufactured by the Ammonia Department of E. I. du Pont de Nemours & Company, has greatly facilitated the rapid seasoning of many lumber items urgently needed for war work. Used in air or kiln drying, it has made possible the seasoning of certain woods with minimum losses due to checks, cracks and other drying defects.

AN EFFECTIVE CONTROL FOR LEAF BLIGHT OF ENGLISH HAWTHORN. Spencer H. Davis, Jr.,, Morris Arboretum Bul., Jan.-March, 1942. Tests in the Morris Arboretum showed that leaf blight on the pink flowering English Hawthorn could be successfully controlled by spraying with Bordeaux 4-4-50 at bud break (April 16) and again on April 22 and 30.

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Authors and Books

The following books may be ordered from TREES Magazine, Box 886, Santa Monica, California.

FREDERICK M. TRIMBLE, author of "Mass Color in Protective Concealment" in this issue of TREES, has a wide range of experience in the plant world. A short snap-sketch of his activities to date follow:

1910-14—Penna. State College, Forestry, A.B., 1914. This included broad training in Silviculture, Ecology and Lumbering in all the forest areas of the United States.

1914-15—Stanford University, Forest Entomology, M. A., 1915. Obtained first-hand knowledge of plant materials in Central California.

1915-16—Deputy Hort. Inspector, Ventura County, California. Obtained wide knowledge of Southern California plant materials.

1917-35—Chief Nursery Inspector, Pennsylvania Dept. of Agriculture. Owned and operated ornamental nursery, 1932-36. Gained experience and knowledge of production and use of all kinds of plant materials.

1935-41—Regional Nurseryman, Soil Conservation Service, U.S.D.A. In full charge of a large production program, serving the twelve Northeastern States.

1941—Engineer (timber) R.E.A., U. S. Dept. of Agriculture Travel throughout forest timber areas of the United States.

THE GARMENT OF GOD, by John C. Merriam, Charles Scribner's Sons, 597 Fifth Ave., New York. 162 pgs. $2.00.

Dr. Merriam as the distinguished President of the Save-the-Redwoods League has written several inspiring books that have come from his association with the magnificent Redwods. This book discusses various types of nature appreciation and the influence it can have on a man's life and its propensity for shaping a philosophy that can influence all thoughts and action. For delightful reading "The Garment of God" is highly endorsed.

ORNAMENTAL AMERICAN SHRUBS, by William R. Van Dersal, Oxford University Press, New York. 288 pgs., illus. $4.00.

Truly an innovation in American publications. It is a discussion of native American shrubs from all sections of the country. Much valuable information concerning cultural methods of the shrubs discussed is given and very accurately. An interesting feature are the lists of the ten most beautiful shrubs for each of five major sections of the country, followed by a composite of the ten most beautiful shrubs in the United States. The author names *Rhododendron calendulaceum* as the finest. A fine garden history of what America has given the world in the ornamental shrub line. You should have this book.

MODERN CAMOUFLAGE, by Major Robert P. Breckenridge, Farrar & Rinehart, Inc., New York, 278 pgs., illus. $3.50.

Most Arborists,, Landscape Architects and Nurserymen are interested in the one subject they feel they are best qualified to serve their country in wartime, namely camouflage. Here is discussed the technical aspects of the science by a man best qualified in the work. The book is profusely illustrated with pictures as well as construction details and drawings of all types of artificial trees, decoy planes, building screens, etc . Plant lists are given for general use thruout continental United States, including shrubs, trees, vines, ground covers and grasses. Undoubtedly the finest book yet published on protective concealment.

WEED CONTROL, by Robbins, Craft and Raynor, McGraw Hill Book Company, Inc., New York. 543 pgs. illus. $5.00.

Altho most of the text of this fine manual is devoted to weeds affecting agricultural lands, there is such an overlapping of the fields attacked by most noxious weeds that the Park Superintendent, with large park areas, the Landscape Engineer, with highway rights-of-way, and others in the ornamental field, will be richly repaid by acquiring this book.

Control, Methods — Chemicals — machinery for applying—Special weed problems of Grasslands and Turf—Weeds on Roadsides, in Nurseries and Greenhouses and in cities are a few of the subjects very thoroughly discussed. There has long been a need for this book and any administrator with weed problems cannot fail to avail himself of this very complete book.

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(Continued from page 8)

the year are going to get the best results.

Only in those areas devoid of all plant growth can we expect to establish permanent concealment. Even here the earth's surface must retain natural appearance and winter operation will require more careful disciplining.

Since the mass color of any given plant growth region will always change with the seasons, it is suggested that living plant material should be used wherever possible for the establishment of permanent concealment. The plants will change in color with the season, without further attention but artificially colored objects associated with the living plants must be frequently changed by the camoufleur to match the color of the living plants. It would therefore appear that successful protections means a year-round job where artificial materials are used in such quantities they can be observed from the air. Accepting the efficient rating of the modern areial camera, equipped with color filters, it is proposed that it may be possible to conceal vital war plants from the enemy more easily with poor specimens of plant growth than by depending upon a mixture involving artificial materials. As contrasted with the exacting demands of the ornamental planting job, as to species, type and cost, it is suggested to limit protective concealment planting wherever possible to real "native" plantings of living materials that will only require exact duplication and the replication of plant groups. In correlation with this it would appear that the development of all new structures and transportation lines important to the war effort should be given every consideration from the viewpoint of the availability of topographic features and plant growth of a type that will offer the maximum of natural protective concealment. All of this concealment work must of course be correlated with the basic construction and use requirement of the particular structure.

ARIZONA COULD SUPPLY NATION'S CABBAGE SEED

TUCSON, Ariz.—Arizona can produce all the cabbage seed that the United States needs, maturing a crop in 10 months instead of the two years required elsewhere, says Dr. Alton H. Finch, head of the horticultural department of the University of Arizona. Tests financed by the United States Department of Agriculture have turned out well at elevations of 2300 to 3000 feet.

'Tree Root' Was Phone Cable

CONCORDIA, Kan.—A sewer digger laboriously cut out a foot-long section of "tree root." It wasn't a root, it was a telephone cable, he discovered as 50 telephones in the neighborhood went out of service.

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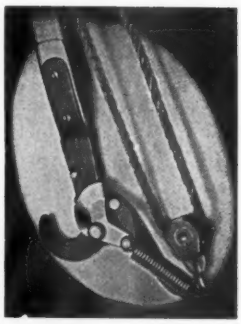
TOBACCO BY-PRODUCTS & CHEMICAL CORP., INCORPORATED · · LOUISVILLE, KENTUCKY

DEFENSE PUTS A PRIORITY ON QUALITY!



Your co-operation in placing a preference rating on your orders will be most helpful.

BARTLETT TREE TRIMMERS are standard in the utility field.

Your Jobber can supply you. Write for catalog No. 27A

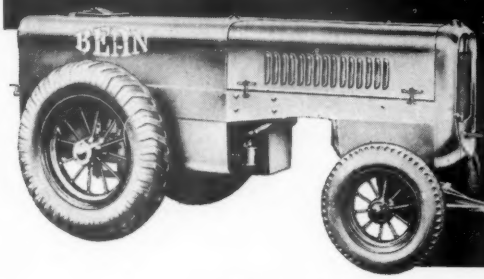
SPECIFY—"BARTLETT, DO NOT SUBSTITUTE"

—

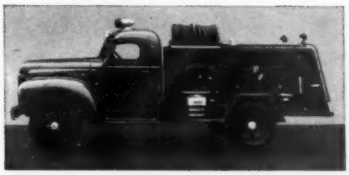
BARTLETT MFG. CO.

3028 East Grand Blvd., Detroit, Mich.

See what the 'BEAN' SPRAY PUMP is doing NOW!



FMC Fire Fighter



A fast-moving, self-contained fire-fighting machine that extinguishes by means of water fog at 600-800 pounds pressure. Saves life and property when fast work is vital. A wartime adaptation of the BEAN *Spray Pump.*

FMC Camouflage Machine

Applies camouflage colorings to air fields, buildings, etc., quickly and effectively by spraying the materials through single or multiple nozzles as required. Another wartime adaptation of the BEAN *Spray Pump.*

FMC Decontaminator

Used to neutralize poison gases that may result from a gas attack. High pressure makes it possible to reach everywhere and cover large areas quickly. Another wartime adaptation of the BEAN *Spray Pump.*

IMPORTANT

Authorized BEAN *dealers are ready in every section with* BEAN *Parts and* BEAN *Service to help you keep your sprayer rolling*

BEAN-CUTLER Division
FOOD MACHINERY CORPORATION

A consolidation of John Bean Mfg. Co. and Cutler Mfg. Co.

136 WEST JULIAN STREET · SAN JOSE, CALIFORNIA
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BEAN SPRAYERS *for* **PERFORMANCE and ECONOMY**

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TRANSPLANTONE

Makes Roots Grow Faster and Reduces Leaf Loss

While TRANSPLANTONE solution usually increases root development on all trees, evergreens or deciduous, it is especially effective on azalea, juniper, rhododendron, pine, hemlock, pyracantha, holly, pin oak and sweet gum. It is cheap insurance against replacement.

TRANSPLANTONE treatment will enable this pine tree to continue uninterrupted growth after being moved.

It pays to water holly, whether Japanese or otherwise, with TRANSPLANTONE solution immediately after moving.

HOW TO USE

REG. U. S. PAT. OFF.
TRANSPLANTONE

Dissolve 1 ounce of TRANSPLANTONE in 10 gallons of water. Apply to the root area of the tree after planting, using at least 1 gallon of solution for each inch of trunk diameter.

3-oz. can $1.00 — 1-lb. can $4.00

Buy from your dealer or write to

AMERICAN CHEMICAL PAINT COMPANY

Horticultural Division T-11 AMBLER, PA.